RELATIONSHIPS BETWEEN EARTHWORMS AND SOIL MESOFAUNA DURING DECOMPOSITION OF CROP RESIDUES

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ВЗАИМООТНОШЕНИЯ МЕЖДУ ЧЕРВЯМИ И ПОЧВЕННОЙ МЕЗОФАУНОЙ ПРИ РАЗЛОЖЕНИИ РАСТИТЕЛЬНЫХ ОСТАТКОВ

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Field Experiment

The objectives were to evaluate a field method for study of earthworm growth and earthworm influence on other soil animals and plant residue degradation.

Polyester net cylinders (Fig.1) were filled with sieved soil, on which 5.00 g of dried plant material was placed, i.e., barley straw, barley roots or meadow fescue shoots. For each type of plant material 10 cylinders,each containing one juv. earthworm (Lumbricus terrestris) were prepared.For each material 10 cylinders were prepared without earthworms. The cylinders were placed in a field plot with the top 5 cm below surface. Half of the cylinders were examined after 56 days (28 Sept.), the rest after 99 days(10 Nov.). The cylinders were divided according to Fig.2.

Earthworms were recovered only in cylinders with meadow fescue. Barley straw or roots seem to have been unacceptable. For earthworm growth see Fig.3. Mass loss of crop residues was greater with earthworms than without.

A tendency towards less mineral nitrogen in earthworm cylinders was found (Table). A tendency for a greater abundance of mesofauna was found in replicates without earthworms (Fig.4). The method works for growth studies and investigations of earthworm influence on biotic and abiotic factors. A somewhat greater container is to prefer.

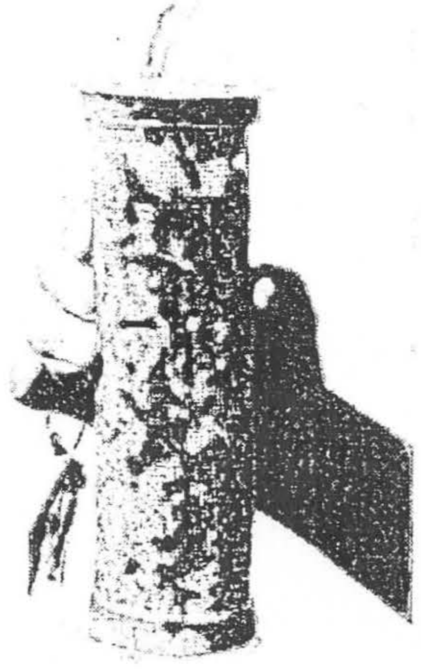
Greenhouse Experiment

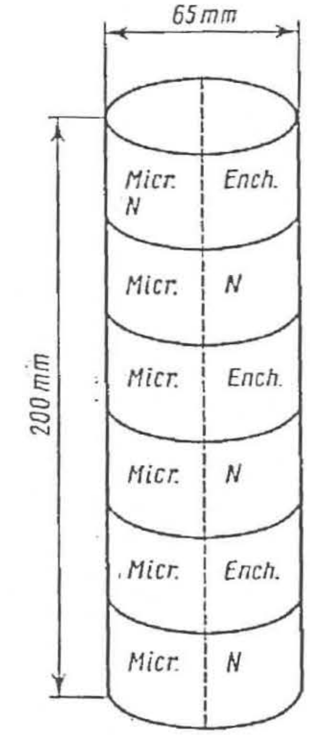
The objective was to investigate microarthropod and enchytraeid abundance in a lysimeter experiment with and without earthworms.

Lysimeters (h=0.6 m, Ø=0.3 m) grown with lucerne or meadow fescue were kept in a greenhouse for ten months, with and without earthworms (A.caliginosa and L.terrestris). Mesofaunal samples were taken in all treatments. A tendency for greater abundance of mesofauna was found in replicates without earthworms (Fig. 5).

General Comment

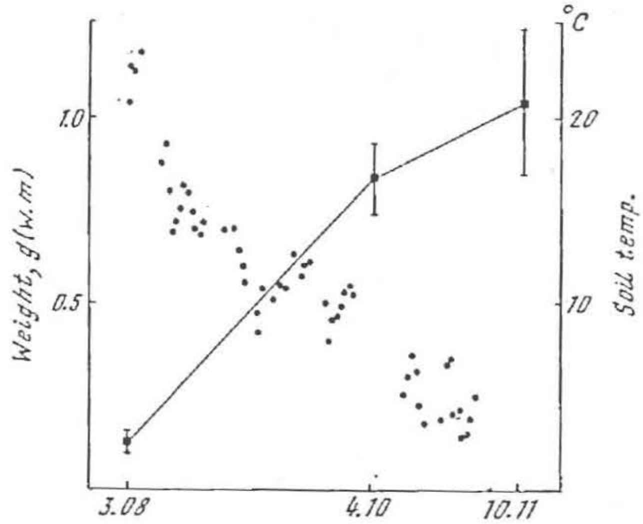
Earthworms may suppress abundance of mesofaunal groups, probably through competition for food and other resources. Thus, in exclusion experiments the effect of earthworms can be underestimated due to an increase in other faunal groups.



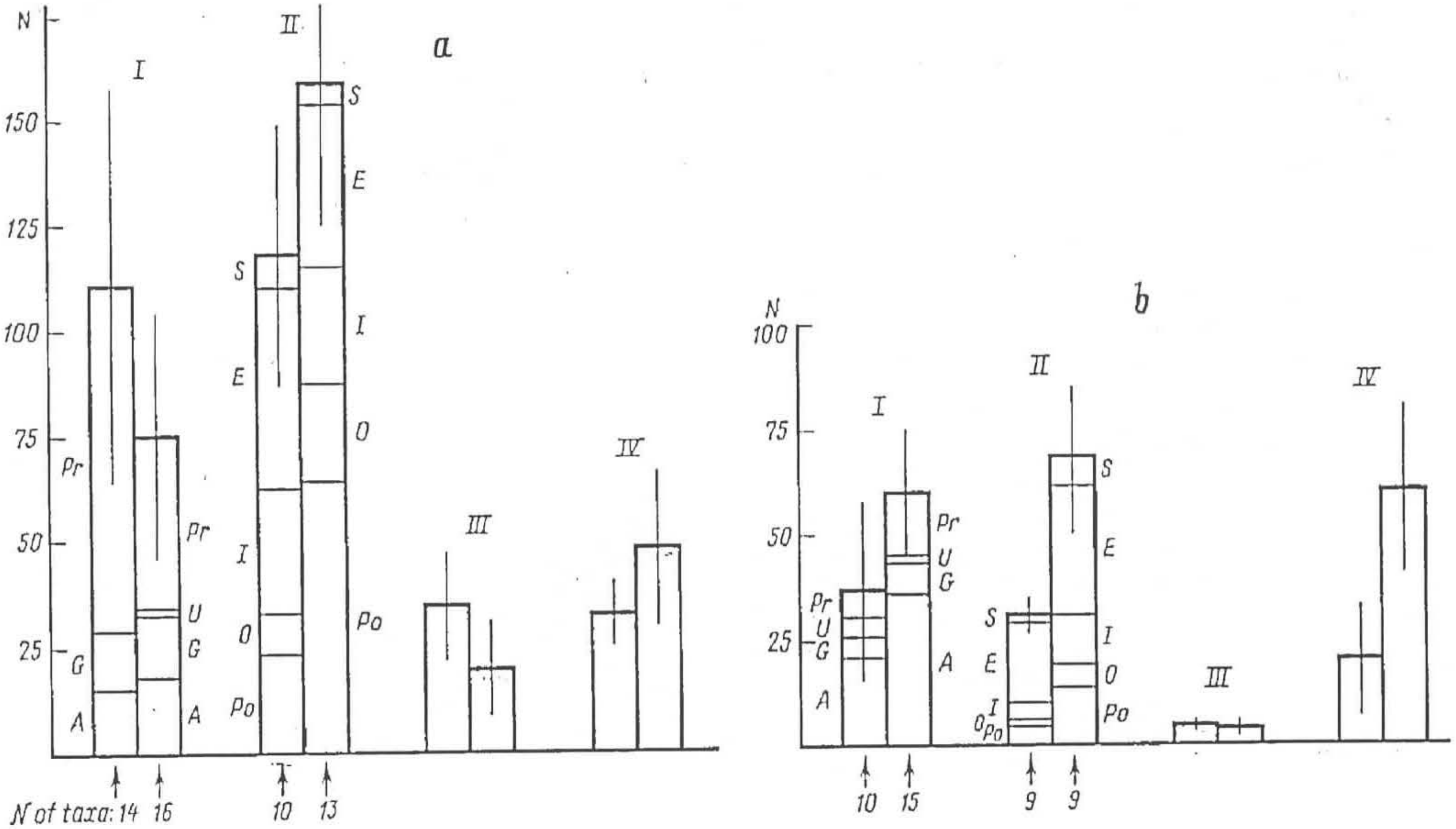


F i g. 1. Polyester net cylinder, h = 200 mm, Ø = 65 mm, mesh size 1 mm

F i g. 2. Division of net cylinder for different analyses: microarthropods (Micr.), enchytraeids (Ench.), NO_3^- and NH_4^+ (N, in the uppermost level analyses were done after Micr. extraction). Macroorganic matter was washed out from the whole cylinder after the other analyses were done

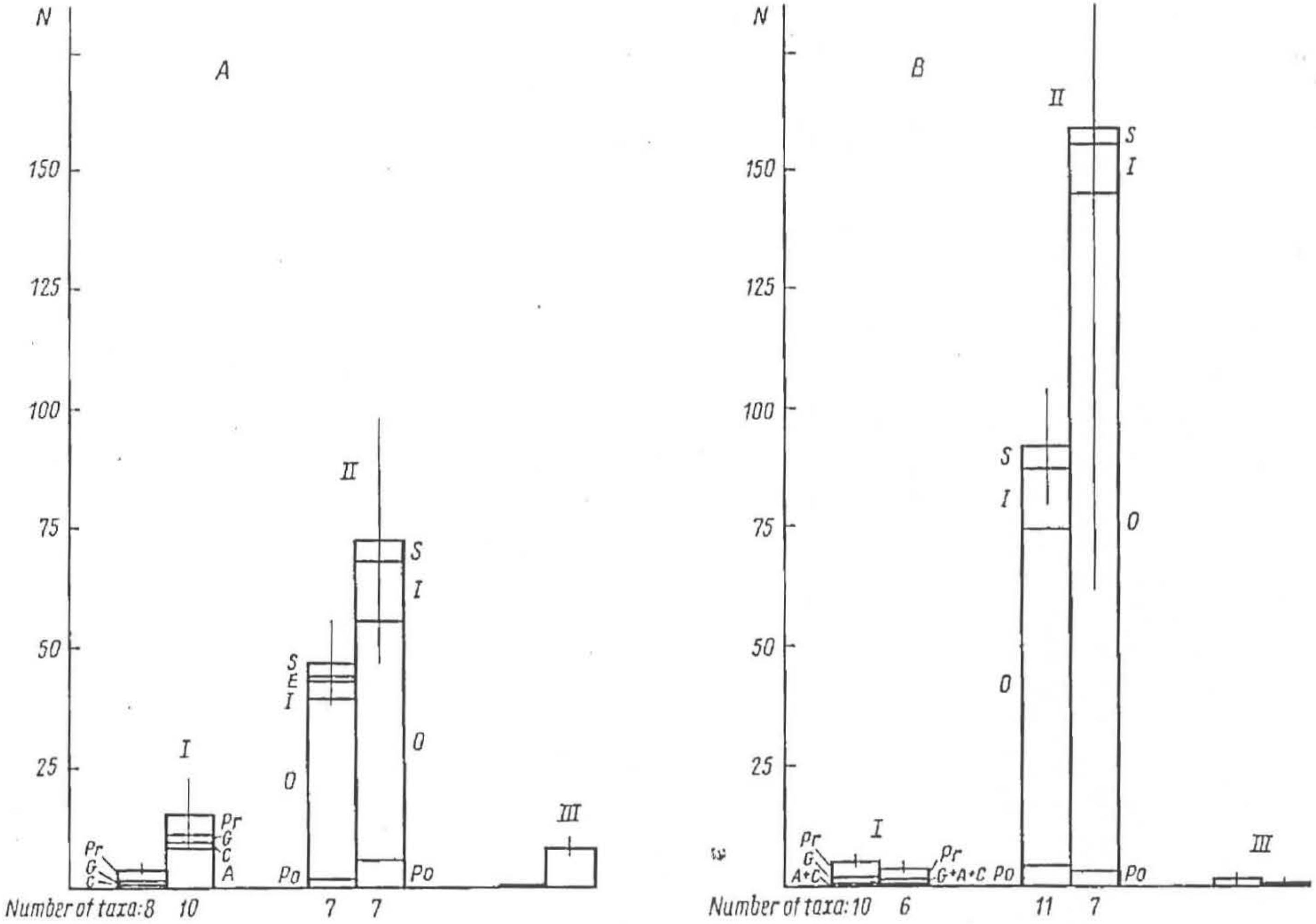


F i g. 3. Growth of juvenile Lumbricus terrestris in the field, mean and range. The dots represent the average day temperature in the soil (10 cm depth)



F i g. 4. Microarthropod groups and enchytraeids in cylinders with (left columns) and without (right columns) earthworms, icubated in field with grass ley

N - mean number per cylinder (663 ml) + S.E. (number of replicates see Tabl.1); a - sampling data 22.09 incubation time - 56 days, b - 10.11, 99 days; I - Acari, II - Collembola, III - Pauropoda, IV - Enchytraeidae; Acari: A - Astigmata, C - Cryptostigmata, G - Gamasina, U - Uropodina, Pr - Prostigmata; Collembola: Po - Poduridae, O - Onychiuridae, I - Isotomidae, E - Entomobryidae, S - Sminthuridae



F i g. 5. Microarthropod groups and enchytraeids in lysimeters with each crop with earthworms (left) and without earthworms (right). 4 soil cores (33 mm diameter) were taken in each lysimeter; lysimeter: A – with lucerne, B – with meadow fescue; N – number of animals per soil core. Abbreviations of animal groups see Fig.4

Field experiment with net cylinders with and without earthworms

Indices	3.08-28.09		3.08-10.11	
	with, n=3	without, n=5	with, n=2	without, n=5
Remaining weight of crop residues g (d.m.) $\bar{x}$(S.E.)	2.85 (0.51)	3.53 (0.15)	1.03 (0.64)	1.80 (0.48)
% of initial weight (5.00 g)	57	71	21	36
Mineral N Content				
[1] NO_3^- $\bar{x}$ (S.E.)	2.16 (0.61)	3.21 (0.83)	1.29 (0.29)	1.38 (0.31)
[1] NH_4^+ $\bar{x}$ (S.E.)	0.38 (0.02)	0.47 (0.05)	0.40 (0.02)	0.40 (0.03)

Note: [1] : mg N per 1 from 10g soil (w.m.) in 50 ml 0.5 M KCL .

Acknowledgements

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